Dr. Anffany Chen

Theoretical Physics Institute and Department of Physics
University of Alberta, Edmonton, Alberta, Canada
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Education

2014/9 - 2019/7 **Ph.D. Physics, Condensed Matter Theory**
University of British Columbia
GPA: 90%
Thesis: Realizing High-Energy Physics in Topological Semimetals
Advisor: Marcel Franz

2013/8 - 2014/6 **M.Sc. Physics**
Perimeter Institute of Theoretical Physics and University of Waterloo
Thesis: Directional Dependence of Phase Transition Splitting by Uniaxial Strain: A New Test to Determine Sr_2RuO_4 Superconducting States
Advisor: Xiao-Gang Wen

2009/9 - 2013/4 **B.Sc. Combined Honours in Physics and Mathematics**
University of British Columbia, Vancouver, BC
GPA: 91%
Thesis: Universal Three-Body Energy Spectrum in 2D Ultracold Bose-Fermi Mixtures Near Feshbach Resonance
Advisor: Fei Zhou

Employment

- **Postdoctoral Fellow** (2021/4 - present)
  Theoretical Physics Institute and Department of Physics, University of Alberta
  Principle Investigators: Igor Boettcher, Joseph Maciejko
  Research topics: Disordered/Interacting quantum systems, Machine learning, Exotic lattice geometry, AdS-CFT correspondence, Topological phases of matter
- **Graduate Research Assistant** (2014/9 - 2019/7)
  Stewart Blusson Quantum Matter Institute and Department of Physics and Astronomy, University of British Columbia
  Principle Investigator: Marcel Franz
  Research topics: Topological phases of matter, Unconventional superconductivity, Interacting quantum systems
- **Teaching Assistant** (2014/9 - 2016/4)
  Department of Physics and Astronomy, University of British Columbia
  Courses taught: Quantum mechanics, Statistical mechanics, Introduction to experimental physics
- **Undergraduate Research Assistant** (2012/4 - 2013/4)
  Department of Physics and Astronomy, University of British Columbia
  Principle Investigator: Fei Zhou
  Research topic: Few-body physics, Ultra-cold atoms
- **Undergraduate Research Assistant** (2011/5 - 2011/8)
  Department of Physics, Academia Sinica, Taiwan
  Principle Investigator: Tsz-King Wong
  Research topic: Dark matter detection
- **Undergraduate Research Assistant** (2010/4 - 2010/8)
  Department of Physics and Astronomy, University of British Columbia
  Principle Investigator: Matthew Choptuik
  Research topic: Numerical relativity

- **Young Engineers and Scientists Fellow** (2009/7 - 2009/8)
  TRIUMF
  Supervisor: Patrick Walden
  Research topic: Nuclear recoil experiments

Leaves of Absence

- Two maternity leaves, 3 months (2021/7 - 2021/10) and 18 months (2019/10 - 2021/3)

Publications

Peer-Reviewed Journal Articles

12. S. Dey*, A. Chen*, P. Basteiro, A. Fritzsche, M. Greiter, M. Kaminski, P. Lenggenhager, R. Meyer, R. Sorbello, A. Stegmaier, R. Thomale, J. Erdmenger, I. Boettcher
Simulating Holographic Conformal Field Theories on Hyperbolic Lattices
Preprint arXiv:2404.03062 (2024); submitted to Phys. Rev. Lett.

11. A. Chen
Many-body mobility edges in 1D and 2D revealed by convolutional neural networks
Phys. Rev. B **109**, 075124 (2024)

10. A. Chen, J. Maciejko, I. Boettcher
Anderson localization transition in disordered hyperbolic lattices
Preprint arXiv:2310.07978 (2023); submitted to Phys. Rev. Lett.

9. T. Tummuru*, A. Chen*, P. M. Lenggenhager*, T. Neupert, J. Maciejko, T. Bzdušek
Hyperbolic non-Abelian semimetal
Preprint arXiv:2307.09876 (2023); accepted by Phys. Rev. Lett.

8. A. Chen, Y. Guan, P. Lenggenhager, J. Maciejko, I. Boettcher, T. Bzdušek
Symmetry and topology of hyperbolic Haldane models
Phys. Rev. B **108**, 085114 (2023)

7. A. Chen, H. Brand, T. Helbig, T. Hofmann, S. Imhof, A. Fritzsche, T. Kießling, A. Stegmaier, L. Upreti, T. Neupert, T. Bzdušek, M. Greiter, R. Thomale, I. Boettcher
Hyperbolic matter in electrical circuits with tunable complex phases
Nat. Commun. **14**, 622 (2023)

6. A. Lau, T. Hyart, C. Autieri, A. Chen, D. I. Pikulin
Designing Three-Dimensional Flat Bands in Nodal-Line Semimetals
Phys. Rev. X **11**, 031017 (2021)

5. A. Chen, R. Ilan, F. de Juan, D. I. Pikulin, M. Franz
Quantum Holography in a Graphene Flake with an Irregular Boundary
Phys. Rev. Lett. **121**, 036403 (2018), Editors' Suggestion
Highlighted in Physics World and Phys.org
Shortlisted for Breakthrough of the Year by Physics World

4. A. Chen, D. I. Pikulin, M. Franz
Josephson current signatures of Majorana flat bands on the surface of time-reversal-invariant Weyl and Dirac semimetals
Phys. Rev. B **95**, 174505 (2017)

3. D. I. Pikulin, A. Chen, M. Franz
Chiral Anomaly from Strain-Induced Gauge Fields in Dirac and Weyl Semimetals
Phys. Rev. X **6**, 041021 (2016)

2. A. Chen, M. Franz
Superconducting proximity effect and Majorana flat bands at the surface of a Weyl semimetal
Phys. Rev. B **93**, 201105 (2016), Rapid Communication

1. P. J. C. Salter, M. Aliotta, T. Davinson, H. Al Falou, A. Chen, B. Davids, B. R. Fulton, N. Galinski, D. Howell, G. Lotay, P. Machule, A. StJ. Murphy, C. Ruiz, S. Sjue, M. Taggart, P. Walden, P. J. Woods
Measurement of the $^{18}Ne(\alpha,p_0)^{21}Na$ Reaction Cross Section in the Burning Energy Region for X-Ray Bursts
Phys. Rev. Lett. **108**, 242701 (2012)

*These authors contributed equally.

Data and Code Repositories

- T. Tummuru, A. Chen, P. M. Lenggenhager, T. Neupert, J. Maciejko, T. Bzdušek, *Supplementary data and code for: Hyperbolic Non-Abelian Semimetal*, Zenodo, doi:10.5281/zenodo.10729119 (2024)
- A. Chen, Y. Guan, P. M. Lenggenhager, J. Maciejko, I. Boettcher, T. Bzdušek, *Supplementary Code and Data for "Symmetry and topology of hyperbolic Haldane models"*, Borealis, doi:10.5683/SP3/NUZRNR (2023)
- A. Chen, *Hyperbolic matter in electrical circuits with tunable complex phases*, Wolfram Community, url:community.wolfram.com/groups/-/m/t/2837328 (2023). Staff Picks and Featured Contributor
- A. Chen, H. Brand, T. Helbig, T. Hofmann, S. Imhof, A. Fritzsche, T. Kießling, A. Stegmaier, L. Upreti, T. Neupert, T. Bzdušek, M. Greiter, R. Thomale, I. Boettcher, *Supplementary Data for Hyperbolic Matter in Electrical Circuits with Tunable Complex Phases*, Borealis, doi:10.5683/SP3/EG9931 (2022)

Presentations

- (Invited) Keynote Talk: *Many-body mobility edges in 1D and 2D revealed by convolutional neural networks*, CAP congress, London, Canada, 2024/5
- Conference Talk: *Anderson localization transition in disordered hyperbolic lattices*, APS March Meeting, Minneapolis, USA, 2024/3
- (Invited) Symposium Talk: *Hyperbolic Haldane Models*, quanTA Symposium, University of Saskatchewan, Saskatoon, Canada, 2023/6
- Conference Talk: *Symmetry and topology of hyperbolic Haldane models*, Topological materials symposium, CAP Congress, Fredericton, Canada, 2023/6
- Conference Talk: *Hyperbolic Chern Insulators*, APS March Meeting, Virtual Meeting, USA, 2023/3
- (Invited) Colloquium: *Hyperbolic Topological Matter*, Department of Physics, University of Alberta, Edmonton, Canada, 2023/1
- Conference Talk: *Quantum Holography in a Graphene Flake with an Irregular Boundary*, Quantum Materials Canada, Virtual Meeting, Canada, 2021/5
- (Invited) Seminar Talk: *Majorana flat bands at the proximitized surface of a Weyl semimetal*, Department of Applied Physics, Nagoya University, Nagoya, Japan, 2017/6
- Poster Presentation: *Superconducting proximity effect and Majorana flat bands at the surface of a Weyl semimetal*, Boulder School for Condensed Matter and Materials Physics, Boulder, USA, 2016/8
- Poster Presentation: *Pauli Blocking Effect on 2D Trimers Near Feshbach Resonance*, Joint Meeting of APS and CAP Divisions of Atomic Molecular and Optical Physics, Quebec City, Canada, 2013/6
- Poster Presentation: *Nuclear recoil energy spectrum of finite-sized dark matter*, 14th Annual Meeting of the Northwest Section of the APS, Vancouver, Canada, 2012/10

Grants and Awards

- **Avadh Bhatia Postdoctoral Fellowship**
  Department of Physics, University of Alberta, 2022/5 - 2024/4
  Competitive research funding of 120,000 CAD for two years
- **Quantum Electronic Science & Technology Ph.D. Award**
  Stewart Blusson Quantum Matter Institute, University of British Columbia, 2016/9 - 2019/7
  Competitive research funding of 90,000 CAD for three years
- **Perimeter Scholars International Award**
  Perimeter Institute for Theoretical Physics, 2013/8 - 2014/6
  Competitive full scholarship covering tuition and living expenses for master's program
- **NSERC Canada Graduate Scholarship (CGS)**
  Natural Sciences and Engineering Research Council of Canada, 2013/8 - 2014/6
  Competitive research funding of 17,500 CAD for one year of master's program
- **NSERC Undergraduate Student Research Award (USRA)**
  Natural Sciences and Engineering Research Council of Canada, 2012/5 - 2012/8
  Competitive research funding of 4,500 CAD for a summer internship
- **James A. Moore Memorial Scholarship**
  University of British Columbia, 2011/9 - 2013/4.
  Scholarship of 30,000 CAD for two years, awarded to the university's top scholar in a Combined Honours program in Mathematics and a science discipline
- **NSERC-CMS Math in Moscow Scholarship**
  Natural Sciences and Engineering Research Council of Canada and Canadian Mathematical Society, 2011/2 - 2011/5
  Competitive award of 9,000 CAD for a Mathematics study-abroad program at the Independent University of Moscow
- **Young Engineers and Scientists Fellowship**
  TRIUMF, 2009/7 - 2009/8
  Competitive research funding of 3,000 CAD for a summer internship at TRIUMF

Numerical Skills

- **Coding**
  Python (including libraries NumPy, SciPy, SymPy, TensorFlow, Scikit-learn, multiprocessing, etc), MATLAB, Mathematica, Bash scripting, HTML, Fortran
- **Data Analysis**
  Statistical and regression analysis, Error analysis, Scaling analysis, Ensemble averaging, Modeling and simulation, Data visualization, Optimization algorithms, Graph analysis
- **Machine Learning**
  Deep learning models, Supervised learning, Cross validation and model selection, Hyperparameter optimization, Feature visualization, Model-specific interpretation, Reinforcement learning

Teaching

Certification

- **CIRTL Associate**
  Center for the Integration of Research, Teaching, and Learning, University of British Columbia, 2017/3
  Completed training for evidence-based STEM teaching

Experience

- **Research Mentor**
  Department of Physics, University of Alberta, 2023/9 - present
  Provided research mentorship to undergraduate and graduate students in my current group
- **Substitute Lecturer**
  Department of Physics and Astronomy, University of British Columbia, 2016/10 - 2017/10, occasional
  Prepared and delivered lectures for third-year quantum mechanics
- **Teaching Assistant**
  Department of Physics and Astronomy, University of British Columbia, 2014/9 - 2016/4
  Taught five semester-long courses as teaching assistant in experimental physics, quantum mechanics, and statistical mechanics. Graded assignments and lab reports. Facilitated lab sessions.

Academic Services

- Referee for peer-reviewed journals, 2017 - present
  - Physical Review Materials
  - Physical Review B
  - Physical Review Letters
- Panelist at graduate student recruitment event, 2023/11
- Interview in The Gateway, University of Alberta's student newspaper, 2023/6
- Organizing committee of CIFAR Quantum Materials Summer School, 2017/4
- Interview in TRIUMF's newsletter, 2015/4
- Organizing committee of Physics Olympics at the University of British Columbia, 2010/3 - 2013/3